

THE DISTRIBUTION OF THE ARCHEGONIA AND THE ANTHERIDIA ON THE PROTHALLIA OF SOME HOMOSPOROUS LEPTOSPORANGIATE FERNS

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It is a well-known fact that in the ordinary *Polypodiaceae*, the archegonia are formed exclusively on the so-called cushion and directly back of the apical notch. Usually the antheridia are produced on the posterior portion of the prothallium, especially among the rhizoids. In some species antheridia are produced also on the lobes and the margins of the prothallium. The small "male" prothallia are frequently covered with antheridia, but under favorable conditions of nutrition, as Miss Wuist (1910) has shown, become monoecious. From some cultures of *Pteris aquilina* L. in which the prothallia were crowded the majority were removed by the writer, and it was found that the smaller remaining prothallia bearing only antheridia assumed the typical heart shape and formed also archegonia as shown in Fig. 1. In this case the original antheridial bearing portion (*a*) can still be readily recognized.

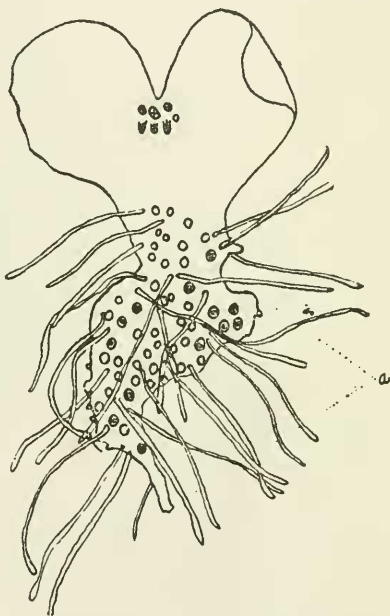


Fig. 1. A prothallium of *Pteris aquilina*. *a*, the original antheridial bearing portion. The archegonia back of the apical notch and the antheridia are diagrammatically represented. x25.

In the *Osmundaceae* the archegonia are produced on the sides of the "mid-rib" which in *Osmunda regalis* is very conspicuous. On

the younger prothallia a single row of archegonia is usually present on each side of the mid-rib and extending from the apical notch to the posterior part of the prothallium where many antheridia are borne, although a large number are frequently produced on the lobes. On the older prothallia numerous archegonia are formed along the sides of the mid-rib. The distribution and the development of the sex organs of *Osmunda regalis* were first described by Kny (1872).

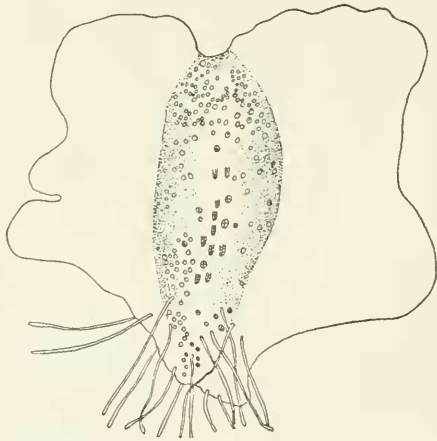


Fig. 2. A prothallium of *Pteris ensiformis* var. *Victoria*, showing archegonia entirely surrounded by antheridia. The sex organs are diagrammatically represented. $\times 12.5$.

The writer found a peculiar arrangement of the sex organs on the prothallia of *Pteris ensiformis* Burn. var. *victoria*. The prothallium in this species produces a prominent and elongated cushion. The archegonia, however, occupy only the highest portion of the cushion. In some instances a few archegonia are developed directly back of the apical notch among numerous antheridia which are always produced on this portion of the prothallium of the *Pteris* species. Many antheridia are also formed on the lower portion of the cushion and on the posterior end of the prothallium. The archegonia are thus wholly surrounded by antheridia (Figure 2). A large number of the prothallia in some of the cultures produced antheridia but in no case archegonia, on both surfaces. Some of the prothallia assumed a nearly vertical position. The two sides of the

prothallia were, therefore, almost equally illuminated, and in consequence dorsi-ventrality was not completely established. Rhizoids and antheridia were, hence, formed on both surfaces.

In some cases the small Stender dishes, used for the cultural work, were only about half filled with sphagnum saturated with a nutrient solution and prothallia of several species were grown on the substratum. Antheridia and archegonia were produced, in consequence of the illumination thus secured, on both surfaces of the prothallia. The same results were obtained by Pierce (1906) who grew the prothallia on a clinostat.

It has been frequently demonstrated that a sufficient reduction in the amount of light inhibits the formation of heart-shaped prothallia and in consequence archegonia are never produced. If favorable cultural conditions are maintained, prothallia may be grown in weak light, and for an indefinite period of time only antheridia will be developed. If the illumination is sufficiently strong for the formation of archegonia, such sex organs will develop with the continued growth of the prothallium provided fertilization is prevented. The prothallia of *Osmunda regalis* were grown under these conditions for about a year and a half. On one of the prothallia, thus produced, approximately a thousand archegonia were counted (Steil, 1918).

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